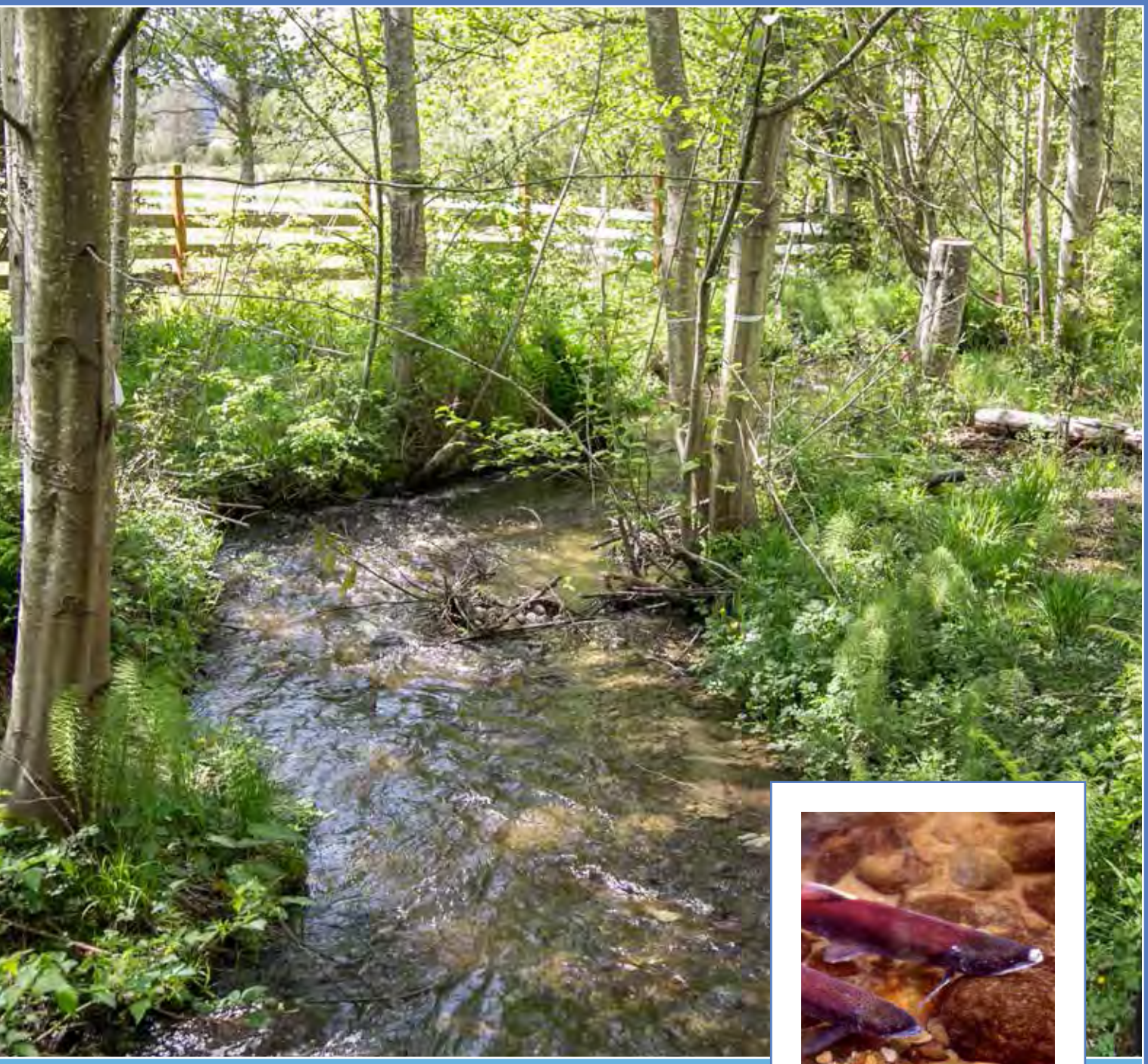
August 2014



Blueprint for the Restoration and Enhancement of Lake Sammamish Kokanee Tributaries

LAKE SAMMAMISH KOKANEE WORK GROUP *Protect · Reconnect · Restore*

Spawning Kokanee

Ebright Creek

Tibbetts Creek

South end of Lake Sammamish, early - mid 1930s

Sammamish Tributaries

Photo credits

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Opposite page:

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▲ Assessment ● Culvert replacement/modification ■ Stream restoration ⬢ Supplementation/reintroduction

	Name of Project	Description
EBRIGHT CREEK- Category One Stream		
1	Lower Reach Stream Enhancement	Reduce bank armoring and flow velocity between parkway and lake.
2	Lower Reach Habitat Protection	Expand lower reach enhancements to protect kokanee habitat.
3	Culvert Replacement at East Lake Sammamish Trail	Replace culvert to improve fish passage and sediment transport.
4	Culvert Replacement at East Lake Sammamish Parkway	Replace culvert to improve fish passage and sediment transport.
5	Middle Reach Restoration	Enhance and restore spawning habitat upstream of parkway.
6	Driveway Bridge Replacement	Repair or replace driveway bridge for fish passage and sediment/wood transport.
7	Culvert Replacement at 12th Street	Replace culvert to modulate stream flow/velocity.
8	Upper Reach Habitat Protection	Protect spawning habitat and prevent or minimize direct impacts to kokanee eggs.
LAUGHING JACOBS CREEK - Category One Stream		
1	Assessment of Reroute Option	Evaluate feasibility of rerouting stream.
2	Lower Reach Restoration	Reroute channel or enhance current channel to improve spawning.
3	Assessment of Parkway Culvert	Evaluate hydraulics and fish passage of culvert under parkway.
4	Restoration in Hans Jensen Park	Install pool-forming structures and spawning gravel to enhance stream channel.
LEWIS CREEK - Category One Stream		
1	Lower Spawning Reach Restoration	Install a series of instream grade-control structures.
2	Upper Spawning Reach Restoration	Install a series of instream grade-control structures.
3	Protection of Riparian Corridor	Develop a landowner stewardship project to help protect the riparian corridor.
4	Trash Rack at I-90 Culvert	Replace or modify existing trash rack.
5	Upper Basin Hydrological Assessment	Assess upper basin to improve stormwater management.
PINE LAKE CREEK - Category One Stream		
1	Pine Lake Creek Basin Assessment/Plan	Assess watershed to identify limiting factors for kokanee.
2	Reach Restoration Downstream of Parkway	Restore or enhance kokanee staging and spawning habitat.
3	Culvert Replacement/improvement at East Lake Sammamish Shore Lane SE	Replace or modify culvert to improve fish passage.
4	Culvert Replacement/improvement at East Lake Sammamish Trail	Replace or modify culvert to improve fish passage.
5	Reach Restoration Upstream of Parkway	Restore or enhance kokanee spawning habitat.
6	Pine Lake Creek Reintroduction	Supplement or reintroduce kokanee into this creek system.
ISSAQUAH CREEK - Category Two Stream		
1	Pickering Reach Habitat Restoration	Improve habitat: remove riprap, add large woody debris, restore native vegetation.
2	Cybil-Madeleine Reach Restoration	Improve habitat: regrade banks, add large woody debris, create side-channel.
3	East Fork Issaquah Confluence Reach Restoration	Improve habitat: regrade banks, add large woody debris and gravel.
4	Issaquah Creek Reintroduction	Supplement or reintroduce kokanee into this creek system.
TIBBETTS CREEK- Category Two Stream		
1	Water Quality Monitoring and Assessment	Continue water quality sampling.
2	NW Poplar Way Stream Restoration	Restore stream channel to provide stream complexity (large woody debris, pools, riffles).
GEORGE DAVIS CREEK - Category Three Stream		
1	Habitat Assessment	Assess habitat conditions to determine potential for kokanee use.
IDYLWOOD CREEK - Category Three Stream		
1	Enhancement of the Idylwood Beach Park Reach	Add gravel to the stream to improve spawning success.
VASA CREEK - Category Three Stream		
1	Hydrologic and Habitat Assessment	Assess hydrologic and habitat conditions for potential kokanee use.
ZACCUSE CREEK - Category Three Stream		
1	Culvert Replacement at East Lake Sammamish Shore Lane	Replace culvert to improve fish passage and natural sediment transport.
2	Culvert Replacement at East Lake Sammamish Trail	Replace culvert to restore fish passage at all flows and natural sediment transport.
3	Culvert Replacement at East Lake Sammamish Parkway	Replace culvert to restore fish passage and natural sediment transport.
4	Channel Reconstruction Through Wetland	Restore channel through forested wetland.
5	Zaccuse Creek Reintroduction	Supplement or reintroduce kokanee into this creek system.

Summary Table of All Kokanee Habitat Projects. NOTE: Project numbers indicate location from downstream to upstream, NOT priority or schedule.

Executive Summary

Introduction and Purpose

The Lake Sammamish native kokanee salmon (*Oncorhynchus nerka*) population is declining precipitously. Unlike their larger relative sockeye salmon, kokanee spend their entire lifecycle in freshwater. They migrate to Lake Sammamish as inch-long fry and spend three to four years in Lake Sammamish before spawning in the late fall and early winter in their natal streams. In the recent decades, their numbers have plummeted and their distribution has been reduced from a large portion of the Lake Washington watershed to only Lake Sammamish and several of its tributary streams.

In 2007, local jurisdictions, government agencies, tribes, community groups, and kokanee advocates in the watershed formed the Lake Sammamish Kokanee Work Group (KWG) to work together to reverse the decline. The KWG established a goal for rebuilding the population: prevent the extinction and improve the health of native kokanee population such that it is viable and self-sustaining, and then supports fishery opportunities. Over the past several years, the KWG and its members have assembled the best science available, conducted assessments, implemented a short-term population supplementation program, supported a series of restoration projects, and reached out to the larger community to educate others on kokanee needs in the watershed.

The purpose of the Kokanee Blueprint is to recommend a new set of restoration actions that build on the latest science and current efforts to move the population closer to recovery. It is critical to have sufficient habitat restored to support a robust, self-sustaining population, particularly once the supplementation program is discontinued by 2021.

Historic Context

The estimated historic extent of spawning areas for native kokanee included several tributaries to Lake Washington, the Sammamish River and tributaries, and Lake Sammamish and several of its tributaries. Native kokanee are now known to spawn consistently in only Lewis Creek, Laughing Jacobs Creek, Ebright Creek, Pine Lake Creek, occasionally in Tibbetts and Vasa Creeks, and along some shoreline areas in Lake Sammamish. This drastic reduction in the geographic distribution of spawning areas significantly raises the potential for a single catastrophic event – whether natural or human-caused – to completely eradicate native kokanee from the watershed. In fact, recent data indicate that two runs of native Lake Sammamish kokanee are likely already extinct. It appears that only the winter/late run kokanee still remains.

Scope and Strategies

The KWG is first focusing on securing the existing, known native kokanee population and the stream habitats it currently relies upon to maintain its existence. Therefore, the geographic scope of this document encompasses the Lake Sammamish basin, which includes the lake and its tributaries. Over the long term, the KWG may expand the Blueprint to address a broader geography to further restore and sustain all the native kokanee populations.

Recovery efforts currently emphasize two strategies: a short-term supplementation program that uses the Issaquah Salmon Hatchery to help stabilize and start rebuilding the population, and a longer term effort to improve or maintain habitat conditions that support the entire kokanee lifecycle. Started in 2009, the intent of the supplementation program is to maintain kokanee populations in natal streams for 12 years (three to four generations of the kokanee population) while habitat conditions are improved to maintain the population naturally. The supplementation program will sunset after the return of kokanee in 2021.

Habitat improvements are essential to restoring a stable and self-sustaining population, both in tributaries that currently support spawning as well as in tributaries infrequently or never used but that could provide spawning opportunities. The Blueprint presents a list of stream restoration and

enhancement projects that are necessary to improve the viability of Lake Sammamish kokanee populations.

Monitoring of the kokanee population and their habitat (e.g., spawner surveys, fry trapping, and water quality) are an integral component of assessing the effectiveness of stream restoration and enhancement projects. Such projects are beyond the focus of this document and will be addressed separately.

It should be noted that land use and stormwater management can have dramatic effects on the stream systems described in this document. In particular, the Lake Sammamish tributaries that support kokanee are threatened by hydrologic impacts resulting from deforestation and bank armoring, increased impervious area, and the timing and delivery of stormwater. The ultimate effectiveness of the actions in this Blueprint will be heavily influenced by the efforts of watershed residents and governments to avoid or mitigate for such impacts. Habitat protection – through, for example, Critical Areas Ordinances, Shoreline Master Programs, Clearing and Grading Ordinances, stormwater management plans, Transfer of Development Rights programs, conservation easements, and other regulatory and non-regulatory tools – is paramount to ensure that investments of public and private funding in Lake Sammamish kokanee restoration projects are not wasted.

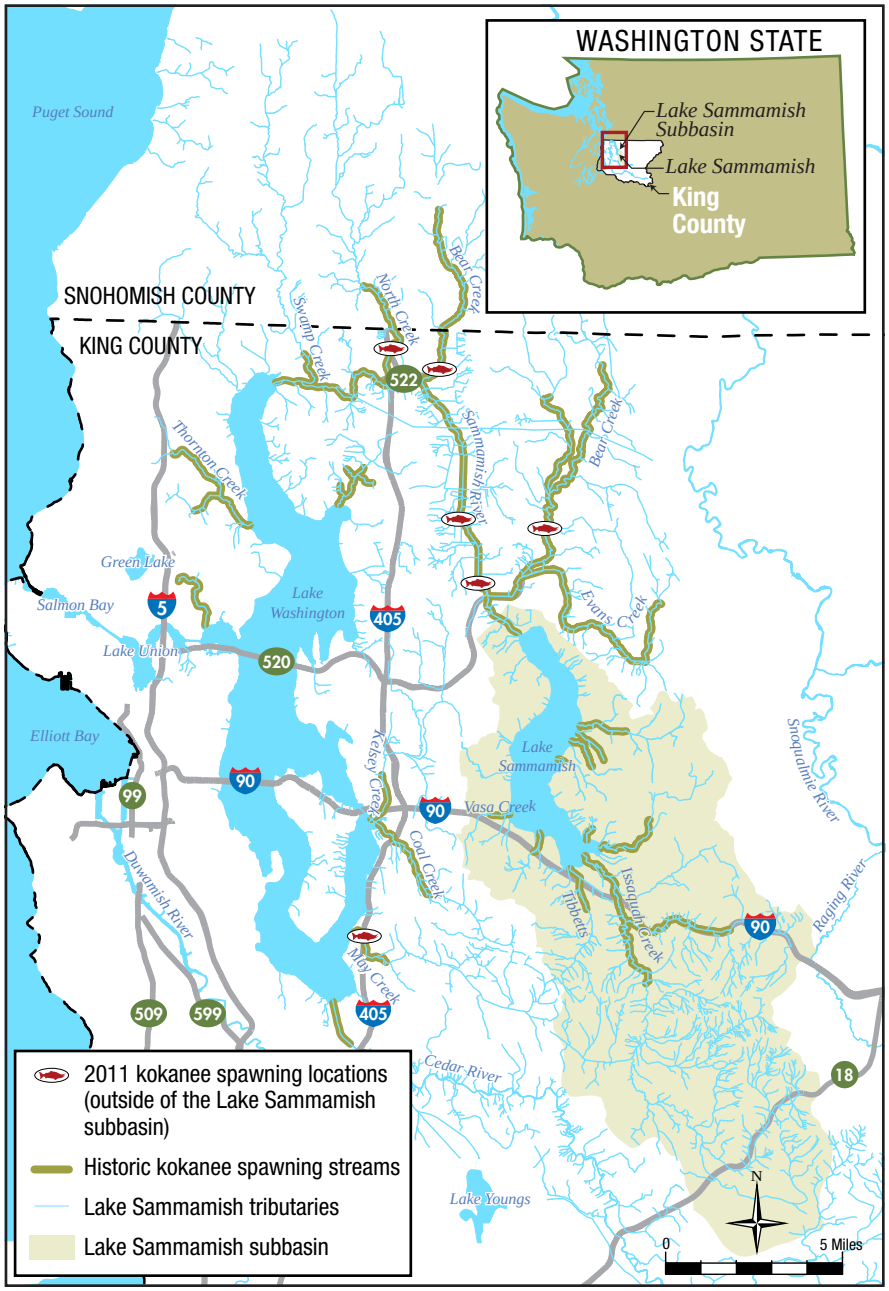

Figure 1. Historic kokanee spawning streams in the Lake Washington basin. The focus of this document is the Lake Sammamish subbasin.

Because the native kokanee salmon spend their entire lifecycle in the Lake Sammamish basin, individual and collective actions have a measureable and direct impact on kokanee recovery and sustainability. The Blueprint offers a set of habitat restoration actions that directly contribute to the recovery of kokanee salmon in Lake Sammamish.

Introduction

There has been a continuing and dramatic decline in the abundance, distribution, and diversity of native kokanee (*Oncorhynchus nerka*) in the Lake Sammamish watershed. In 2007, local jurisdictions, government agencies, tribes, community groups, and kokanee advocates in the watershed formed the Lake Sammamish Kokanee Work Group (KWG) in an effort to work together to reverse the decline. The KWG established a goal for rebuilding the population: prevent the extinction and improve the health of native kokanee population such that it is viable and self-sustaining, and then supports fishery opportunities. Over the past several years, the KWG and its members have assembled the current science and implemented and supported a series of projects and other actions focused on achieving the goal. The purpose of this Blueprint is to recommend a new set of actions that are expected to build on the best science available and prior actions to move the population closer to recovery.

Historical Context

Historically, kokanee were found in many streams throughout the Lake Washington basin (Figure 1) and were represented by three distinct run timings (summer/early-run, winter/late-run, and fall/middle-run). The summer/early run, which spawned primarily in Issaquah Creek, has not been observed in recent years and is considered extinct. The winter/late run spawns in small tributaries to Lake Sammamish and is the focus of this document.

The fall/middle run spawned in tributaries to Lake Washington, including the Sammamish River and its tributaries. In recent years, few kokanee-like fish have been observed and genetic analyses suggest they may actually be residual sockeye salmon. However, in 2011, good numbers of kokanee-like fish were observed in five locations in the Sammamish River and its tributaries (a few were also observed in May Creek). Because they were spawning in December and many had bright red coloration, they appeared to be more like kokanee than residual sockeye salmon. Genetic samples were taken from a total of 217 fish from six sites (Figure 1), which represented a small portion of the total run. Genetic analyses of these fish are not complete, but a preliminary analysis indicates they are distinct from Lake Sammamish kokanee. It is unclear if the kokanee-like fish in the Sammamish River and its tributaries represent a separate kokanee population or are residual sockeye salmon. Because of the uncertainty of the origins of the Sammamish River fish, we have decided to include only the winter/late-run kokanee in this document.

Geographic Scope

The geographic scope of this Blueprint encompasses the Lake Sammamish watershed, including all waters (i.e., the lake and its tributaries and their subbasins) upstream of the weir at the north end of Lake Sammamish, where the lake discharges to the Sammamish River and eventually Lake Washington (Figure 1). This geographic scope reflects the initial interest of the KWG in securing the existing, known native kokanee population and the stream habitats it currently relies upon for its ongoing existence. Over the long term, the KWG may seek to expand this Blueprint to include a broader geography as a means to further restore and sustain native kokanee populations.

Recovery Strategies and Focus of the Blueprint

Recovery efforts for Lake Sammamish kokanee currently emphasize two strategies: a short-term supplementation program to help rebuild the population and a longer term effort to improve or maintain habitat conditions in streams and the lake, such that all stages of kokanee are supported (Figure 2). The supplementation program involves collecting gametes from spawners in Lake Sammamish tributaries and incubating them at the Washington Department of Fish and Wildlife's Issaquah Creek Hatchery to increase egg-to-fry survival rates relative to those in natal streams. The supplementation program was initiated in 2009 and is scheduled to run for 12 years or three to four generations of the kokanee population, which means the 2021-2022 return will be the final return from which hatchery production is currently anticipated.

Habitat improvements to spawning tributaries are essential to restoring a stable and self-sustaining population. In particular, habitat improvements are needed in tributaries that currently support spawning as well as tributaries that are infrequently or never used but could provide spawning opportunities critical to sustaining a stable, robust kokanee population. In this document, we present a list of suggested stream restoration and enhancement projects needed to help improve the health of native kokanee populations. Listed projects were drawn from a series of meetings and discussions involving KWG members including landowners and watershed residents; staff from local, state, federal and tribal government agencies; non-governmental organizations; and others to gather information on viable projects to help recover kokanee populations. Biological monitoring projects (spawner surveys, fry trapping, etc.) of kokanee populations are an integral component of assessing the effectiveness of stream restoration and enhancement projects but are beyond the focus of this document.

This Blueprint focuses primarily on new opportunities and priorities for restoration projects or assessments that would inform the development and implementation of restoration projects. The KWG encourages the recognition by users of this Blueprint that the stream systems in which these projects will be implemented are prone to degradation as a result of land use and stormwater management actions in their immediate vicinity and upstream. In particular, the Lake Sammamish tributaries that support kokanee are threatened by hydrologic impacts resulting from deforestation, increased impervious area, and inter-basin transfers of stormwater. The ultimate effectiveness of the actions in this Blueprint will be heavily influenced by the efforts of watershed residents and governments to avoid or mitigate for such impacts. Habitat protection -- through for example critical areas ordinances, Shoreline Master Programs, clearing and grading ordinances, stormwater management plans, transfer of development rights programs, conservation easements, and other regulatory and non-regulatory tools -- is paramount to ensure that investments of public and private funding in Lake Sammamish kokanee restoration projects and supporting assessments do not merely result in "treading water."

Organization of Blueprint

For the purposes of understanding the opportunities for action, Lake Sammamish tributaries were divided into four categories based on current and potential kokanee use (Figure 3):

Category 1

Primary current kokanee spawning streams - over the past 18 years (period of consistent monitoring), the vast majority of late-run kokanee spawned in these streams (Ebright Creek, Laughing Jacobs Creek, Lewis Creek, and Pine Lake Creek).

Category 2

Large streams in the south end of the Lake Sammamish basin that currently do not support many kokanee but have the potential to support a large run (Issaquah Creek and Tibbetts Creek).

Category 3

Small secondary streams that have potential for kokanee spawning. During the 2012-13 spawning season, some kokanee were observed in each of these creeks.

Category 4

Other small tributaries with little to no recent information and likely have limited potential for kokanee spawning.

Within these four categories, each listed tributary has its own sub-section that features the following:

- Goal/vision
- Description of the tributary's role for kokanee
- Map of proposed projects
- Table briefly describing and classifying proposed projects (assessment, culvert replacement/modification, or stream restoration);
- List that further explains each project and provides, as a starting point and where available, estimated planning level costs, funding needs, duration and project lead if known;
- Another table that suggests project timelines;
- Team members who developed the project list; and
- Pertinent references.

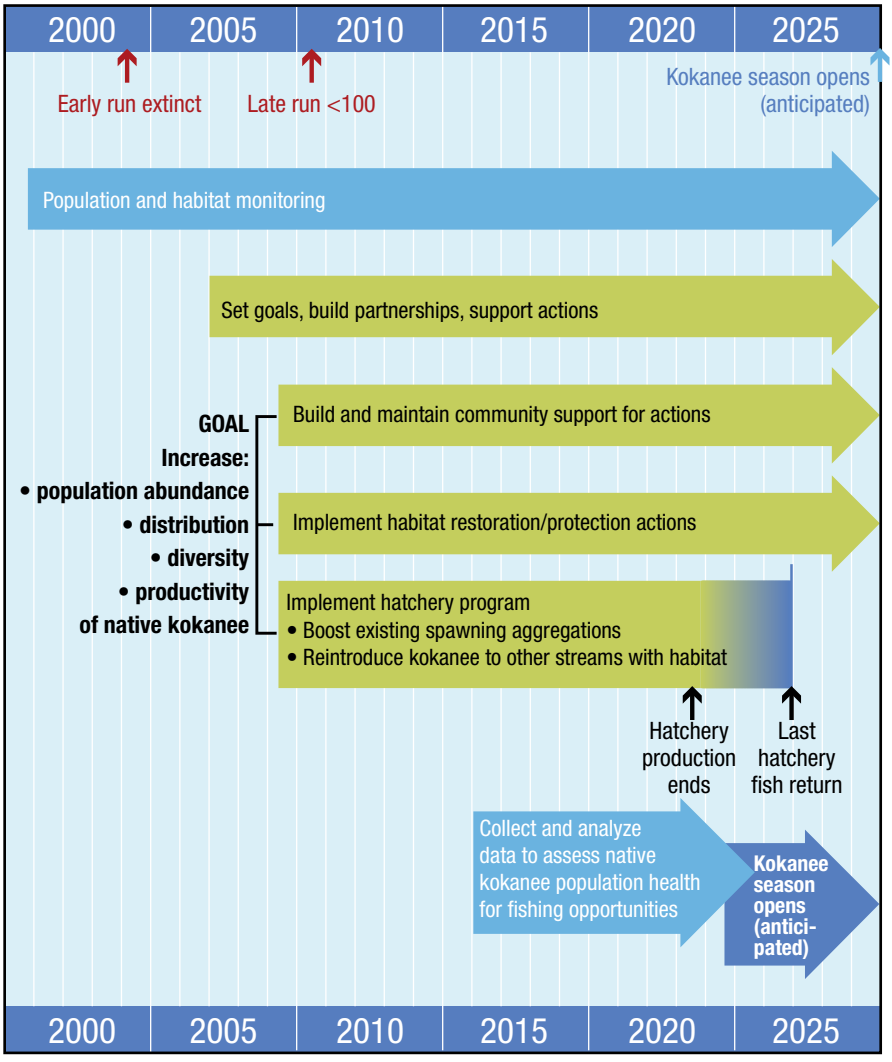

Figure 2.
Expected timeline for recovery of Lake Sammamish kokanee.

Figure 3. Locations of Lake Sammamish tributaries assessed for potential restoration/ enhancement projects to benefit kokanee populations.